Instructions: *Use Times New Roman font size 11, 1.0 pt text space, and* ***maximum three A4 pages****, including any figures.*

Name or type of instrument	**Somalogic's SomaScan Platform**
Unit	Affinity Proteomics Stockholm
Platform	Clinical Proteomic and Immunology
Applicant (Head of Unit)	Claudia Fredolini
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Instrument, acquisition cost (kSEK)	8000
Funding applied for (kSEK)	6000

Description of the instrument

Describe the instrument, its purpose, and its specific capabilities. If possible, provide a link to a web page describing the type of instrument. Does the instrument represent a new technology at the unit, or is it a replacement/upgrade of current equipment base? Is the instrument unique in terms of service to users nationally?

SomaLogic's SomaScan platform is an advanced high multiplex aptamer-based proteomic technology that currently allows the simultaneous quantification of ~7000 proteins (and expanding) in a small volume of biofluid (55 µL) (https://somalogic.com/SomaScan-platform/). SomaScan is currently the only affinity proteomics platform capable of achieving such a multiplex analyte level and possibility to cover a large number of biological pathways and functions with high precision [PMID: 35984888]. The unique feature of the assay is a new generation of affinity reagents: Slow Off-rate Modified Aptamer (SOMAmers). SOMAmers are single-stranded DNA-based affinity reagents that contain chemically modified nucleotides, enhancing target specificity and sensitivity. Unlike antibodies, SOMAmer reagents can be generated at an unlimited scale, enabling unmatched reproducibility and offering a robust platform for biomarker discovery and validation. The SomaScan assay has already proven its capability to support precision medicine and diagnostic testing in a number of high-impact studies performed by SomaLogic's own lab in the USA (https://somalogic.com/publications/), but the technology is still not available in any laboratory in Sweden or elsewhere in Europe. The aim of this application is to request the necessary fundings to acquire the instrumentation needed to establish a SomaScan service site at the SciLifeLab Affinity Proteomics Stockholm Unit.

Workflow and Equipment needed.

The assay principle is based on the design of SOMAmers, which on one hand act as protein binding reagents capturing a protein in solution, and on the other hands includes a unique nucleotide sequences recognizable by specific hybridization probes for a quantitative readout on DNA microarrays.

The assay is performed as follow: SOMAmers, labeled with a fluorophore, and immobilized to streptavidin beads via biotin and a photocleavable linker are incubated with biofluids such as serum, plasma, urine. Proteins captured by SOMAmers are then biotinylated and the photocleavable linker allows to release the SOMAmer/protein complex back into the solution (Catch1). Biotin-tagged proteins are recaptured on fresh streptavidin beads (Catch 2), the SOMAmer reagents are released, and allowed to hybridize to complementary sequences on a microarray chip (Catch 3). The abundance

of each protein is derived from the amount of fluorescent intensity that is detected from each fluorophore (**Figure 1**).

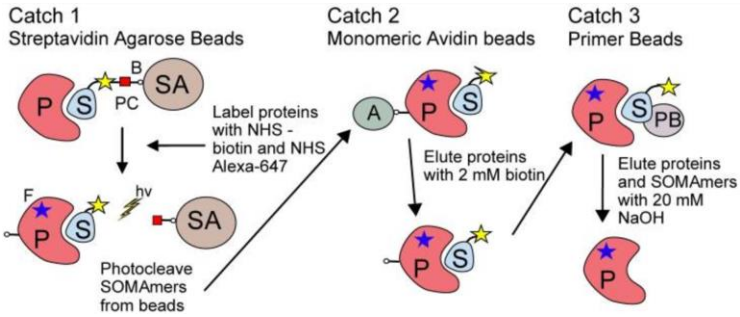

Figure 1. SomaScan Assay schematic representation from L.Gold et al PLoS One. 2010; 5(12): e15004.

Somalogic developed an accurate and robust **automated pipeline** which requires a specific set of instruments to certify the assay's performance. The main components for the workflow are:

(i) **A customized liquid handling robot (Tecan Fluent 780)**, which is equipped with a Multiple Channel Arm with 384 Channel Head and capable of perform heating and shacking steps and to handle 96 and 384 plate formats. Tecan Fluent 780 is required during the initial steps of the assay (from sample incubation with SOMAmers to their final release from streptavidin beads) The total cost for the robot including Fluent Control software and Fluent Touch Screen will be 2300 kSEK. A few Fluent components (plate shakers with temperature control), which were not originally available from Tecan have been further modified and customized by Somalogic. The cost of these parts will be 1700 kSEK

(ii) **Microarray Scanner** (**SureScan, Agilent Technologies**) and complementary components (Hybridization Chamber; Hybridization Oven**;** Microarrays and Rotator Rack for Hyb Oven are required for assay read-out, which implies the hybridization of SOMAmer reagents on a microarray chip. SureScan is DNA Microarray Scanner with SureScan High-Resolution Technology enables automated high-speed scanning. The scanner is equipped with advanced optics component, electronics, and software features an extended dynamic range (XDR) of up to 20 times greater than other leading scanners, and fast high-resolution scanning of up to 2 micron in under 20 minutes. The cost for the scanner and complementary components is 1500 kSEK.

(iii) Complementary Equipment. A number of small instruments is required during sample processing including: Rock thawing station (BioMicroLab); Staining Dish System (Cole Parmer);Rainin Span 6 pipettor (Rainin); Quad Microplate Shacker Incubator (Grant Instruments);Little Dipper Slide Washer (SciGene);Matrix Tube Decapper (Thermo Scientific). The overall cost for the complementary equipment has been estimate to be 2500 kSEK.

Summary of the cost for the acquisition of the SomaScan platform.

Instruments	**Cost (kSEK)**
Customized Fluent 780 (Tecan)	4000
(SureScan Microarray Scanner (Agilent Technologies)	1500
Complementary equipment	2500
Total cost	**8000**
Fundings applied for from SciLifeLab	**6000**
Co-funding Facility Fee (2023-2024)	**2000**
Co-funding VR Infrastructure (decision pending)	**1600**

Statement of need

Describe how the instrument will be crucial for the operations, productivity, development, and competitiveness of your unit. Estimate the need and impact of the instrument from a user perspective. Will the instrument be shared with or used by other units or research groups at SciLifeLab? Also, describe any co-funding plans.

SomaScan is a worldwide unique affinity proteomics technology with exceptional potential in clinical research and precision medicine. Since 2010 when the technology was first introduced [PMID: 21165148], several high impact studies have been performed on this system (https://somalogic.com/publications/), and it would strengthen SciLifeLab's offerings, expertise in affinity proteomics, increasing competitiveness, quality, and uniqueness of our service in the field.

In 2022, SA Williams and colleagues published the results of a large investigation where SomaScan was applied to profile 5000 proteins in 32,130 plasma samples from nine clinical study. The analysis resulted in a 27-protein model predicting 4-year likelihood of myocardial infarction, stroke, heart failure, or death [PMID: 35385337]. Furthermore, Somalogic is currently collaborating with University Hospitals and healthcare providers such as the Harrington Heart & Vascular Institute as part of its SomaSignal™ Proteomics for Precision Medicine Initiative and the Pittsburgh-based healthcare provider UPMC to explore and validate the potential impact of the technology in treatment decision and clinical care, see GenomeWeb. SomaLogic has also established a Centre for Excellence in Proteomics of Cancer with the Imperial College London and their European Prospective Investigation into Cancer and Nutrition (EPIC).
The technology is currently offered exclusively by Somalogic, therefore, if it will be implemented in our lab, the Affinity Proteomics-Stockholm will likely be the only or first service laboratory providing SomaScan in whole Europe. The system is a perfect complement to the Olink Explore platform offered by our node in Uppsala. The evaluation of a synergistic application of the two technologies has previously shown that the advantage of using the two technologies in parallel lies on the possibility to perform a comprehensive proteomic profiling and a cross-platform validation of the discoveries (orthogonal validation). [PMID: 34819519]. SciLifeLab would become the only place in the world to offer both technologies.
The instruments that will be acquired such as Fluent 780 (Tecan) and the SureScan Microarray Scanner (Agilent) can be useful in a broad range of applications and methods. However, we forsee a high demand hence instrumentation may be dedicated exclusively to the SomaScan assay to ensure the quality of the data generated. Based on an evaluation of project requests from Europe and in particular from the Nordic countries performed by SomaLogic, we would expect, during the first couple of years after installation, a flow of more than 4400 samples incoming from studies ongoing mostly in Sweden (Linköping, Umeå and Astrazeneca), Norway, Germany, UK, Belgium and Netherlands. The instrumentation, will be therefore reasonably co-funded by facility user fees. Reagents cost, calculated per plate, is 400000 SEK per 86 samples, if we estimate a facility fee of 15% on the cost to cover general lab consumables and instrument maintenance, we expect a user fee income of 3000 kSEK of which 2000 kSEK could be used to cover instruments costs. The Affinity Proteomics Unit together with the Autoimmunity and Serology Unit at the CPI SciLifeLab platform has also submitted an application for a VR Infrastructure grant, that if granted could co-fund the instrument acquisition for 1600 kSEK.

We have spent years to promote SciLifeLab for SomaLogic to be the perfect place to offer their technology for Swedish and European scientists. During the international evaluation, we were even recommended to consider SomaLogic's technology, but it was just recently that SomaLogic changed their business strategy to allow other labs to offer their technologies. The time is right for adding SomaLogic to SciLifeLab's infrastructure.